Aug. 15, 1950 R. H. GODDARD 2,518,881

FUEL FEEDING AND COOLING CONSTRUCTION FOR ROTATING COMBUSTION CHAMBERS

Filed June 25, 1947

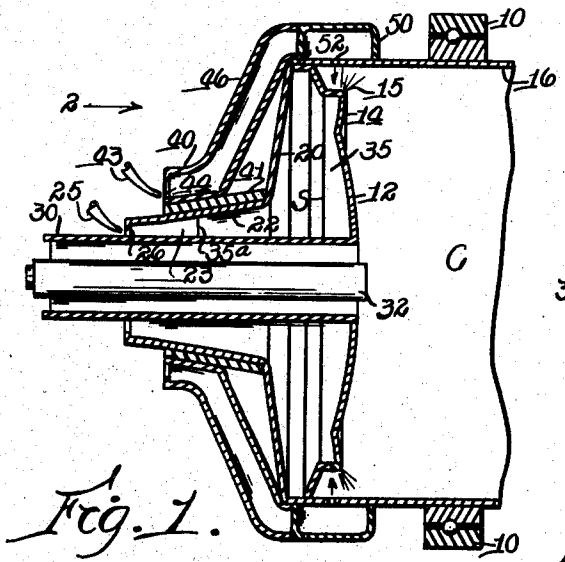

Fig. 1.

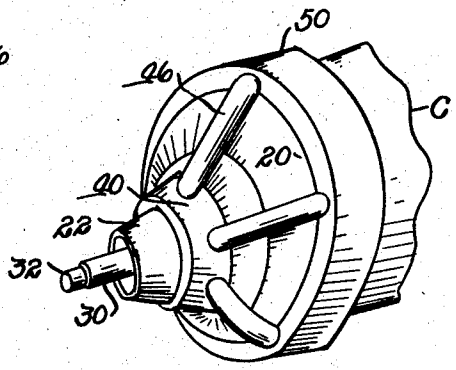

Fig. 2.

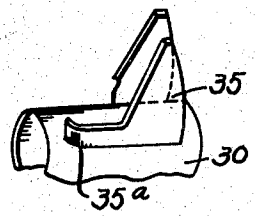

Fig. 3.

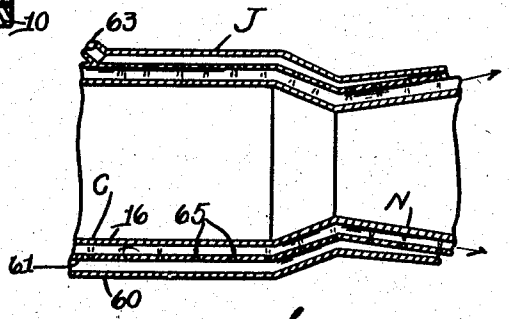

Fig. 4.

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FUEL FEEDING AND COOLING CONSTRUCTION FOR ROTATING COMBUSTION CHAMBERS

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5 Claims. (Cl. 60—44)

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This invention relates to combustion chambers of the rotating type and as used in propulsion apparatus. Rotation of the combustion chamber produces very intimate intermingling of the combustion liquids, and the centrifugal effect of the rotating parts makes the provision of special feed pumps for the combustion liquids unnecessary. The centrifugal action also tends to distribute any unvaporized liquids as a protective and cooling film on the inner surface of the rotating combustion chamber.

Such a rotating combustion chamber is shown and fully described in the prior Goddard Patent No. 2,395,403, issued February 26, 1946. In said patent, effective means is also shown and described for rotating the combustion chamber by the reaction of spiral vanes mounted within the discharge nozzle.

An important object of the invention is to provide improved constructions for feeding two different combustion liquids, as gasoline and liquid oxygen, to a rotating combustion chamber, and for effectively mixing and intermingling said liquids as they enter the combustion chamber. Provision is also made to prevent freezing of the gasoline by the liquid oxygen.

A further feature of the invention relates to the provision of improved means for cooling the walls of such a rotating combustion chamber.

The invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

Preferred forms of the invention are shown in the drawing, in which

Fig. 1 is a partial sectional side elevation of a combustion chamber embodying an improved feeding construction;

Fig. 2 is a perspective view, looking in the general direction of the arrow 2 in Fig. 1;

Fig. 3 is a detail perspective view of certain radial vanes to be described; and

Fig. 4 is a longitudinal sectional elevation of a portion of a combustion chamber embodying an improved cooling construction.

Referring to Figs. 1 to 3, a combustion chamber C is shown which is supported for rotation on bearings 10. The chamber C has an inwardly convex end wall 12 provided with nozzle projections 14 each having a feed opening 15 through which a combustion liquid, as liquid oxygen, may be sprayed outwardly against the inner face of the combustion chamber wall 16.

The combustion chamber C also has an end casing 20 enclosing a jacket space S. An outwardly and axially projecting conical portion 22 thereof encloses an annular feed passage 23 to which liquid oxygen may be fed from a stationary nozzle 25 through an end opening 26.

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A tubular member 30 is mounted at the center of the convex end wall 12 and projects outward to form the inner wall of the passage 23. Any suitable igniter 32 may be mounted in the tube 30.

Radial vanes 35 (Fig. 3) are mounted on the tube 30 and support the convex end 12 and the casing 20 in spaced relation. The vanes 35 preferably have hook-shaped end portions 35a extending into the annular passage 23, which end portions assist in picking up the liquid oxygen and directing it into the channels between the vanes, where it is transferred outwardly by centrifugal force.

An annular casing 40 is mounted outside of the axial projection 22 of the casing member 20 and is preferably spaced therefrom by a heat-insulating sleeve 41. Gasoline or other liquid fuel is fed from one or more nozzles 43 through an annular opening 44 into the end of the member 40.

A plurality of tubes 46 extend outward from the member 40 and connect said member to an annular casing 50 surrounding the rear end portion of the chamber C.

The gasoline flows by centrifugal force from the annular member 40 to the annular casing 50 through the pipes 46, and is fed under pressure from the member 50 to the chamber C through spray openings 52, which are preferably more or less closely aligned with the spray openings 15 previously described.

The gasoline and oxygen sprays thus engage each other and are effectively mixed and intermingled. The convex contour of the end wall 12 is desirable, as it tends to prevent separation of the liquid oxygen from the end wall and thus more effectively cools said wall.

A considerable portion of the oxygen injected through the spray openings 15 directly engages the cylindrical chamber wall 16 and forms a protecting film over the inner face of this wall. It should be noted that the tubes 46 are substantially spaced from the end casing 20, so that freezing of the gasoline in the tubes 46 is effectively prevented.

If additional cooling is desired, a jacket J having an outer wall 60 and an inner wall 61 may be mounted in fixed position outside of and concentric with the combustion chamber C and its nozzle N. A cooling liquid, as water, may be supplied to the jacket space through a feed pipe

63, from which it will be sprayed on the outer surface of the chamber wall 16 through a plurality of feed openings 65. It is desirable that the openings 65 be very fine, so that the sprays engaging the wall 16 may be immediately vaporized. Otherwise the rapid rotation of the chamber C may cause the cooling liquid to be thrown outward and separated from the chamber wall, thus largely reducing the cooling effect.

Having thus described the invention and the advantages thereof, it will be understood that the invention is not to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what is claimed is:

1. In a rotating combustion apparatus, a rotating combustion chamber having an end wall with an axially offset cylindrical portion and having a plurality of outwardly-directed spray openings in said offset portion and near the periphery of said wall, an annular casing member surrounding the upper part of said combustion chamber and having a plurality of spray openings directed inward through the combustion chamber wall and toward the axis of said combustion chamber, and means to supply combustion liquids to said two sets of openings.

2. In a rotating combustion apparatus, a rotating combustion chamber having an end wall with an axially offset cylindrical portion and having a plurality of outwardly-directed spray openings in said offset portion and near the periphery of said wall, a jacket for said end wall, an annular casing member surrounding said combustion chamber and having a plurality of spray openings directed inward through the combustion chamber wall and toward the axis of said combustion chamber, means to supply liquid oxygen to said end wall jacket, and means to supply gasoline to said annular casing member.

3. The combination in a rotating combustion apparatus as set forth in claim 2, in which the latter means comprises an axial sleeve, and a plurality of radiating tubes spaced from said end wall jacket and connecting said sleeve to said annular casing member.

4. The combination in a rotating combustion apparatus as set forth in claim 2, in which the oxygen-supplying means comprises an axial sleeve opening into the jacket space, and radial vanes in said sleeve and jacket, which vanes hold said sleeve and jacket in spaced relation and subdivide the jacket space and have curved entrance ends in said sleeve to engage and divert the entering liquid oxygen into said subdivided jacket space.

5. In a rotating combustion apparatus, a rotating combustion chamber having an end wall having outwardly displaced portions providing a plurality of outwardly-directed spray openings near the periphery of said wall, an annular casing member surrounding said combustion chamber and having a plurality of spray openings inwardly-directed to said combustion chamber and adjacent said outwardly-directed openings, and means to supply combustion liquids to said two sets of openings.

ESTHER C. GODDARD,
Executrix of the Last Will and Testament of Robert H. Goddard, Deceased.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,395,403	Goddard	Feb. 26, 1946